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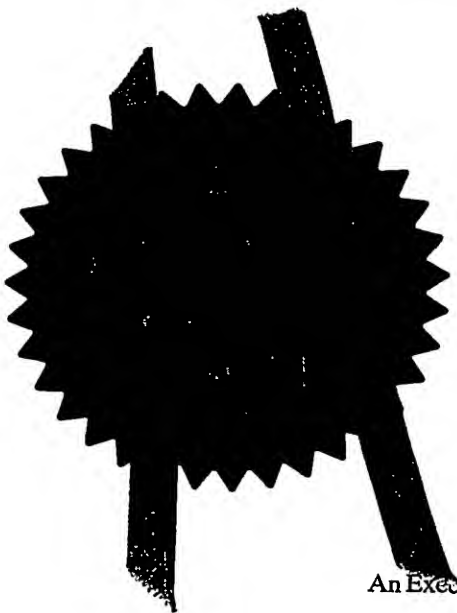
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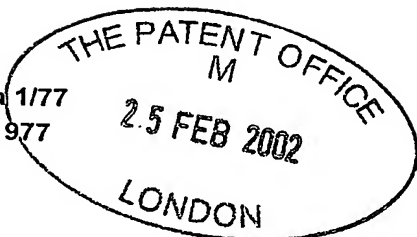
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Request for grant of a patent

25 FEB 2002

The Patent Office
Cardiff Road
Newport
South Wales NP10 8QQ

1. Your reference
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2. Patent Application Number
0204323.0

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Scientific Generics Limited
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Patents ADP number (if known)

If the applicant is a corporate body, give the
country/state of its incorporation

Country: ENGLAND

4. Title of the invention
SIGNALLING SYSTEM

5. Name of agent
Beresford & Co

"Address for Service" in the United Kingdom
to which all correspondence should be sent

2/5 Warwick Court
High Holborn
London WC1R 5DH

Patents ADP number

1826 001

6. Priority details

Country

Priority application number

Date of filing

Patents Form 1/77

7. If this application is divided or otherwise derived from an earlier UK application give details

Number of earlier application

Date of filing

8. Is a statement of inventorship and or right to grant of a patent required in support of this request?

Yes

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Description

23 ✓ w

Claim(s)

0

Abstract

0

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Priority documents

0

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Statement of inventorship and right to grant of a patent (*Patents form 7/77*)

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Request for preliminary examination and search (*Patents Form 9/77*)

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Request for Substantive Examination (*Patents Form 10/77*)

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11. I/We request the grant of a patent on the basis of this application

Signature

Beresford & Co
BERESFORD & Co

Date 25 February 2002

12. Name and daytime telephone number of

BRINCK; David John Borchardt

person to contact in the United Kingdom

Tel: 020 7831 2290

Signalling System

Inventors: Ian Michael Hosking and Aled Wynne Jones

Summary

The benefits of captioning systems for the hard of hearing are well understood. However caption systems can be costly and they often obscure part of the picture. This problem is particularly acute in cinemas. This invention makes use of standard mobile phones to receive, synchronise and display caption text.

Problem

A significant proportion of the population with hearing difficulties benefit from captions on video images such as TV broadcasts, video tapes, DVD and movies. However, there are a number of problems with current solutions. With open captions systems where the text is displayed on screen it obscures part of the image. This presents a particular problem with cinema where there is a reluctance for this to happen with general audiences. It is also not possible to personalise content eg different languages. There are closed caption systems where the text is displayed on a separate screen. The problem with such a solution is that it adds additional cost and complexity and such systems have had poor take up in cinemas for this reason.

Invention

This invention uses widely available phone and hand-held computers as the caption display device. The invention relates to how these can be used to successfully display captions that are accurately synchronised to the video/picture content.

Caption text

The caption text can be transmitted to the hand-held device either in advance of the programme content happening or simultaneously with the content.

If it is done in advance this can be achieved by well recognised methods such as transfer by memory card, cable, infra-red link or over a radio communications network such as the mobile phone network or a wireless LAN. The caption text can be stored on a database and made available via the Internet for download by the methods described above. The caption text would contain timecode related information that would be triggered during the programme using timer in the phone and/or with some form of external synchronisation.

Real-time delivery could be by similar methods but could include transmission of the text information in the audio of the content using a range of acoustic transmission techniques such as WO: 98/32346. Other techniques include: simple amplitude and frequency modulation of tones, echo modulation, critical band encoding. Masking of the data sound can be performed using a variety of psycho-acoustic approaches. At the required data rate for real-time transmission it is likely that it may be obtrusive to listeners with normal hearing therefore performing the transfer in advance is advantageous.

Synchronisation

Synchronisation of the text is important to ensure that it occurs at the right point in the programme content. It is particularly important when the captions are loaded on to the hand-held device in advance. The captions could be started by the user pressing a button and button based control could be provided to adjust the synchronisation during the programme. Once initiated synchronisation would be maintained by using a timer in the device that triggers the captions based on related timing information associated with the text. This has the advantage of being simple but requires obvious cues that a deaf person can interpret. It also suffers from potential clock drift between the source and the timer in the device. A better solution is to provide cues directly to the device. This can be done by embedding synchronisation cues in the audio of the programme content. These can be decoded by using a microphone and processor found in digital mobile phones. Embedding cues only, rather than the text requires a significantly lower data rate and can be inserted at convenient points where the audio will mask them. The techniques for this are similar to those described above for transmission of the caption text.

The synchronisation codes used can either be the same code repeated whenever the synchronisation is required or it can be a unique code at each synchronisation point. ~~The advantage of having a unique code at the synchronisation point is that a user who enters the film or requires the captions only at certain points (for example a user who can only rarely requires the language translation captions) can start captioning at any point during the film. This is completely in the control of the user in this method.~~

It is envisaged that the synchronisation codes will only be required every minute or so in a preferred deployment. This results in very low obtrusiveness of the synchronisation codes. For lower power consumption in the hand held device it is possible to set up the hand held device so that it knows when to expect the synchronisation code approximately if it has downloaded the text and synchronisation choreography prior to the code being transmitted. For example, when a user enters a cinema they start the captioning option on their hand held device. The hand held device listens continuously for a synchronisation code until it receives one. The hand held device can then start the captioning from the point which corresponds to that particular synchronisation code (either the beginning or if it is a unique code then the unique point in the film that that corresponds to). The hand held device knows approximately when to expect the next synchronisation code (from the synchronisation choreography previously downloaded) and so it can save power by switching off the listening mode until a time window around the expected synchronisation point. This time window can be defined by the manufacturer of the hand held device or the user. This allows the hand held device to check its synchronisation with the film every minute or so in a low power mode.

To those skilled in the art it is possible to extend this text captioning to audio captioning. For example, the portion of the population who are visually impaired would benefit from additional information about what is happening on the screen. This cannot be delivered through a textual interface but could be delivered through the audio channel of the hand held device. The synchronisation and source of the audio captioning would be the same as that for the text captioning and can be downloaded prior to viewing. The user would then put earphones on during the show so that they can receive the extra information. This could also be used to transmit a different

GENERICS

language if the film has been dubbed so that each listener in the cinema could have their preferred language playing.

Other solutions for cues using a radio network such as a Wireless LAN or infra-red could also be used. Cues could also be taken from the video content.

Display

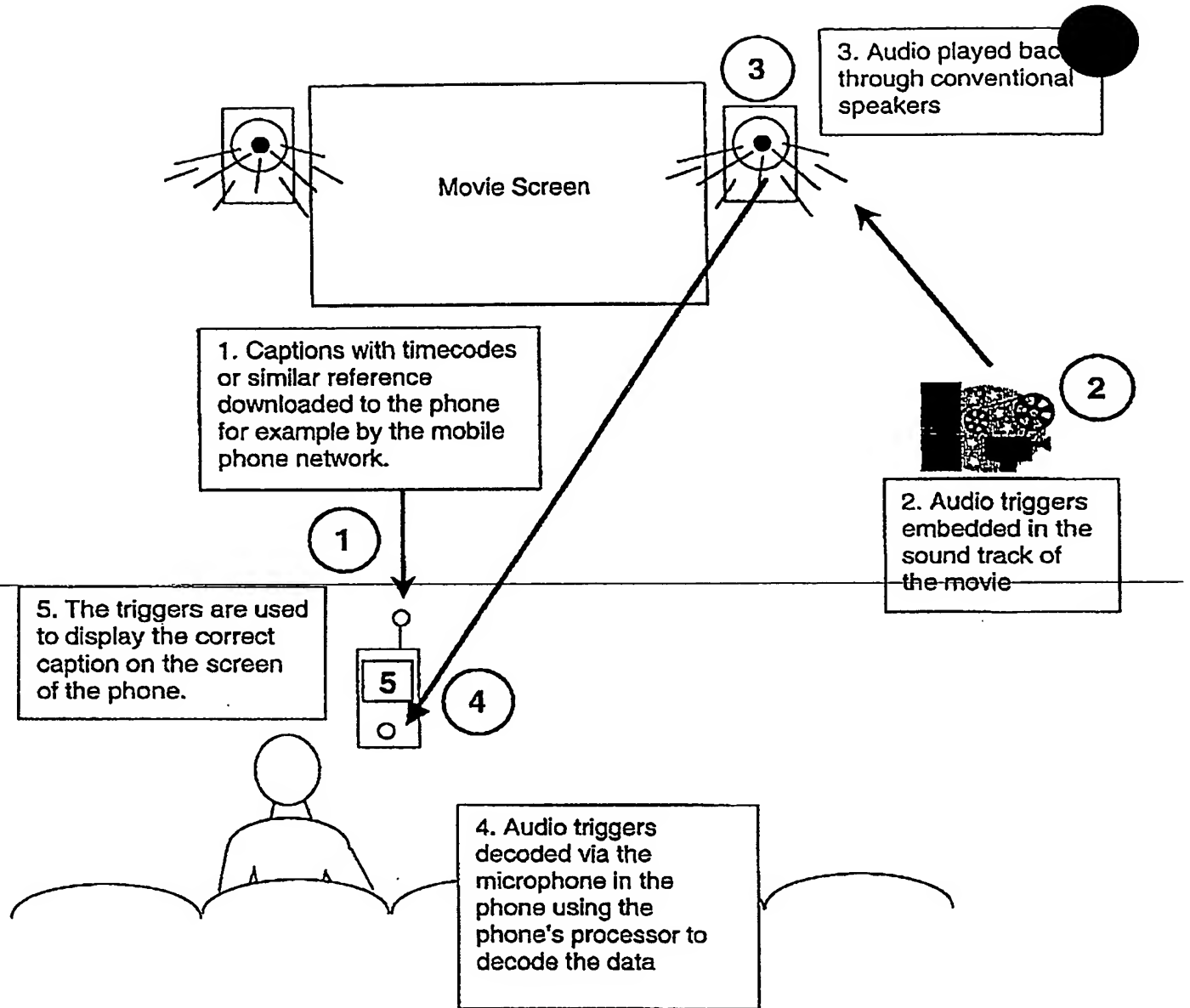
The display could also be performed using 'head-up display' principles and equipment to enable the viewer to see the content and the captions simultaneously.

Personalisation

One of the advantages of using a hand-held device is that the caption content can be varied on an individual basis. For example different languages or additional information eg the directors comments or the names of the actors in a film.

Applications

Other applications include captioning for radio, TV, recorded media, opera, theatre, public presentations.



A schematic outlining a system for closed captioning in cinemas using a mobile phone for the download of caption text, decoding of acoustic synchronisation signals and display of the caption text.

Intrasonics Movimate

Equal Access in Cinemas

A Submission for the Film Council's 'A Better Picture' Consultation

February 2002

movimate



captions



language



audio



create



education



interaction

EXECUTIVE SUMMARY

There are strong legal and commercial drivers to provide captioning and audio description in cinemas. However current and proposed on-screen solutions are unlikely to give universal access to all films in all cinemas. This is because such solutions are seen as obtrusive to the general audience, require significant infrastructure and lack flexibility regarding the caption and description content. This situation raises the question as to whether there are any viable, low cost, off-screen alternatives.

The document describes such an alternative called Intrasonics MoviMate. This system works by using standard mobile phones as a caption display and description playback device. The captions or descriptions are downloaded to the phone and precisely triggered by hidden synchronisation codes in the audio of the film. The advantages of this system include:

- Any film, any time potential
- ~~Content variation possible within a single screen e.g. multiple languages~~
- Requires no fixed infrastructure in the cinema
- Uses standard mobile phone technology
- Caption and descriptions can be authored using a standard PC
- Can be used at non-cinema venues
- Interactivity possible e.g. for advertising
- Potential to display synchronised interactive educational content e.g. how the film was made
- Potential to provide supporting descriptions to help understand a film better e.g. for specialist films.

This document compares MoviMate to the other alternative options and outlines a phased approach to deploying MoviMate.

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1 BACKGROUND

This document is a submission in response to the 'A Better Picture' consultation paper. It addresses Measure Three – Support for Cinema Exhibition and in particular option 'c' concerning UK-wide provision for people with sensory disabilities and new screens. This document summarises the aims of equal access, discusses the various solutions for providing access and describes Intrasonics Movimate as an additional solution to the current DTS based proposal.

2 THE GOAL OF EQUAL ACCESS

Although the goal of equal access is obvious there is a tension between aiming for full or universal access (any film, any time) and partial access (some films, some of the time). This tension is driven by the very real practical and resource constraints of providing full access. This submission will argue that there is a real option of providing universal access in a way that addresses these constraints.

Other points of note worth summarising are:

- There is the need to meet the legal requirements of the Disability Discrimination Act 1995 (DDA) which requires 'reasonable adjustment' such as the provision of captions and audio descriptions. This has resulted in individuals filing lawsuits in the US with regards to the US's comparable legislation Section 508.
- There is strong commercial value in addressing the needs of a significant majority. The RNID estimate that there are nearly 9 million people in the UK with hearing impairment¹ The RNIB estimate that there are over 1 million people in the UK that could register as being blind or partially sighted.²
- A large proportion of people with sensory disabilities have other disabilities as well. *visually impaired*
- The provision of secondary information such as captions and descriptions has much wider benefit. For example it can be used for:
 - language translation
 - providing additional information and commentary for cinema education
 - making specialised films more accessible to a general audience

¹ RNID estimates based on National Study of Hearing (A Davis, Hearing in Adults, Whurr 1995) and current general population estimates.

² Estimates for 1996 based on RNIB prevalence rates

3 INTRASONICS MOVIMATE

3.1 Overview

Intrasonics MoviMate is a captioning and audio description system that uses a mobile phone as a portable display or playback device. Precise synchronisation is achieved with the movie by embedding Intrasonics Sync codes in the soundtrack of the movie. These codes are unobtrusive to the audience but can be decoded by the microphone and processor in the phone in conjunction with Intrasonics software running on the phone. The system is currently working on a Nokia 9210 that is already popular with the hard of hearing as it is good for text messaging and runs the RNID textphone application.

3.2 How it Works

An Intrasonics MoviMate user would undertake the following steps:

1 Download Captions or Audio Descriptions

The captions or audio file can be downloaded in a number of ways, the main ones being:

- Via the Internet and then to the phone from a PC using the standard software that comes with the phone.
- Via the mobile network. This is fine for captions and would only take a couple of minutes but is currently not suitable for high quality audio descriptions because of the size of the audio file.
- Via the infra-red port on the phone
- From a memory card

2 Synchronise

At the beginning of the film the user simply presses a start button to start the captions/descriptions. The software then automatically synchronises using the hidden sync codes in the film soundtrack.

MoviMate can also ensure that the phone doesn't audibly ring during the performance.

3 Watch or Listen

The user simply listens to the audio via a handsfree headset or views the captions on the phone's screen. Caption viewing on the phone does present the problem of 'split viewing'. This can be moderated by a simple lens and mirror arrangement that makes the caption image appear at the same focal point as the cinema screen. Initial designs of this have already been explored and Generics

has display and industrial design experts who could develop a low cost easy to use solution.

Caption Creation

The caption file format for the phone is very simple as it consists of the caption text and timings. This means that new captions can easily be created using a tool such as spreadsheet. This flexibility gives the potential to create a variety of different caption content.

Audio Description Creation

Audio description work using the common 'wav' file format. This again makes creation and distribution of new audio descriptions easy.

Interactivity

Since the solution is based on a mobile phone full interactivity can be provided, for example interacting with adverts or questionnaires before the film starts.

3.3 Key Features

- Any film, any time potential
- Content variation possible within a single screen e.g. multiple languages
- Requires no fixed infrastructure in the cinema (although portable lens & mirror systems may be desirable)
- Uses standard mobile phone technology
- Caption and descriptions can be authored using a standard PC
- Can be used at non-cinema venues and using other media types e.g. video and DVD
- Works with any audio system
- Interactivity possible e.g. for advertising
- Can be used to display synchronised interactive educational content e.g. how the film was made
- Can be used to provide supporting descriptions to help understand a film better e.g. for specialist films.

3.4 Applications

The flexibility of Movimate allows a wide variety of secondary content to be created. This can be used in the following ways:

Caption variation

Caption content can be easily varied for example

- Full captions
- Sub-titles
- Summary only i.e. key words
- Varied highlighting and emphasis of text

Audio description variation

In a similar manner to captions audio content can be varied.

Multiple-languages

Multiple-languages are easy to support even on a single screening. It is also possible to switch between languages during the performance and display two languages simultaneously where the phone has a sufficiently large screen.

Educational content

The content of the captions or audio can be educational. This can either be general education e.g. historical points or specifically cinematic education e.g. how a particular scene was filmed.

Commentary

More general commentary can be provided such as:

- The director's comments
- Explanation of complex plots
- Actor details

3.5 Deployment Options

To ensure a successful deployment of Movimate a 3 phase approach is recommend.

Phase 1: Technical Trial

The aim of the technical trial is to show that Movimate works effectively in a cinema environment. This will build on the testing that has already been done to date. In particular it will allow key stakeholders to see and critique the system in operation.

Cost: £40K budgetary estimate

Output: Report with feedback from key stakeholders

Timing: Within 6 weeks of agreement

Phase 2: Consumer Trial & Commercial Framework Definition

This phase will conduct a thorough end-to-end testing of how consumers will use the system in reality. This will include the download of captions/descriptions, in-cinema use and re-use of the system for other films. It will also allow for the discussion and agreement of an acceptable commercial framework to fund a sustainable system.

The aim will to elicit feedback and improve the operational aspects of the system.

Cost: £110K budgetary estimate

Output: Report with operational recommendations

Timing: Within 16 weeks of agreement

Phase 3: Commercial Deployment

The 'In-cinema infrastructure free' nature of Movimate will allow rapid deployment across the UK. However it is essential that the correct commercial framework with all the parties involved is agreed to ensure sustainability in the long term. This phase will ensure that proper consultation is undertaken and that the agreed approach is integrated with other initiatives.

It will also help to fund the development of a web-site that will serve as an information point and download for caption and descriptions and allow the recommendations of the previous 2 phases to be implemented.

Cost: Full costing can be done based on the specific requirements across the UK. It is important to state that this would be significantly higher than phases 1 and 2 but should be significantly less than other solutions.

Output: Operational in cinemas around the UK

Timing: Starting in Q4 2002 with phased roll-out

Commercial Model

This proposal outlines partial funding to help accelerate an initiative to deploy Movimate. Full funding will need to be met by a combination of the stakeholders involved. It is envisaged that the core of this will come from exhibitors and distributors. It is acknowledged that other initiatives in the industry are held back by the complexity of the value chain. In this case we believe that Movimate will produce clear benefits at a modest cost due to its low infrastructure requirements.

Generics would be happy to submit fully costed detailed plans for the three phases outlined. This would require proper consultation to ensure that all the stakeholders' requirements are appropriately accounted for.

4 OPTIONS

The current proposal for captioning and description provision is based on the DTS-CSS soft subtitling system. However there is a range of options and specific solutions available.

4.1 Captioning

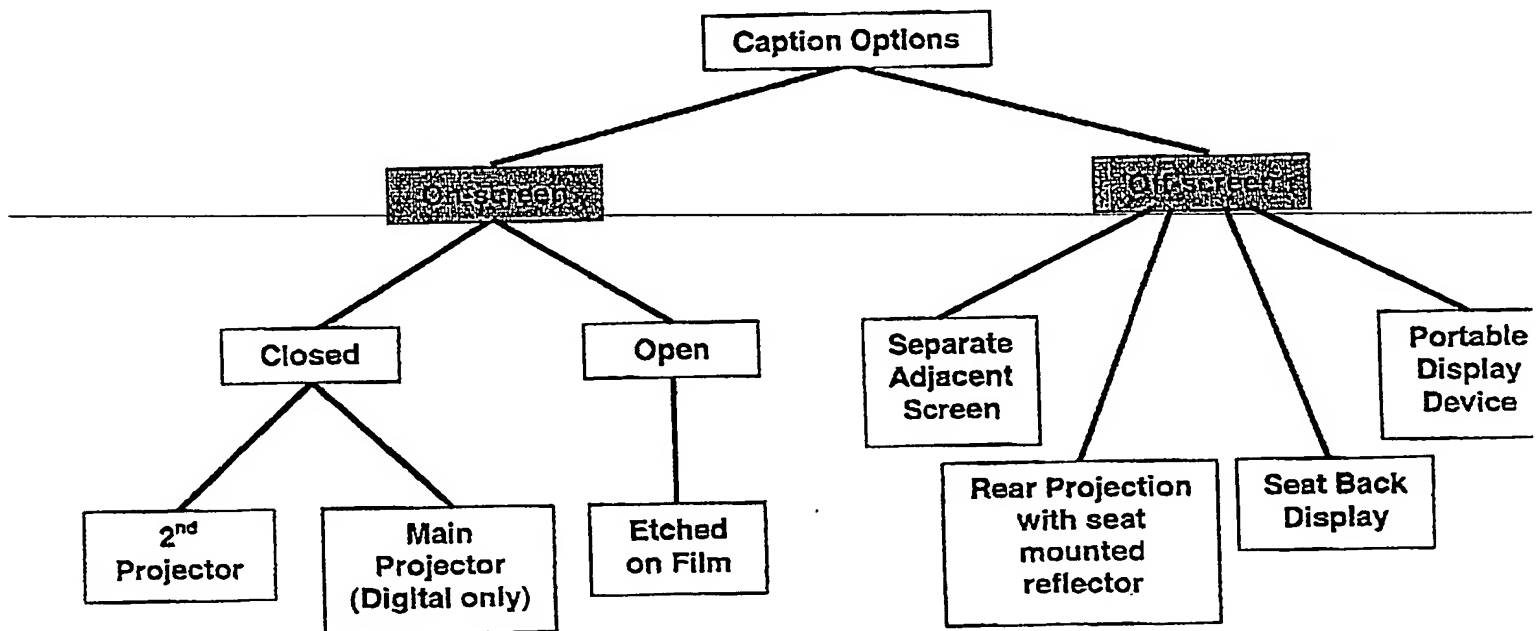


Figure 1 – Shows the main options for captioning

| Option | Comments |
|--------------------------|--|
| Second Projector | DTS-CSS |
| Main Projector | Reliant on the roll-out of e-cinema |
| Open Captions | Currently limited print runs (captions etched on films) |
| Separate Adjacent Screen | Used for live theatre and opera where there is no primary display screen |
| Rear Projection | Rear Window® Captioning System |
| Seat Back Display | Costly and requires wiring on a per seat basis |
| Portable Display Device | Intrasonics™ Movimate |

4.2 Audio Descriptions

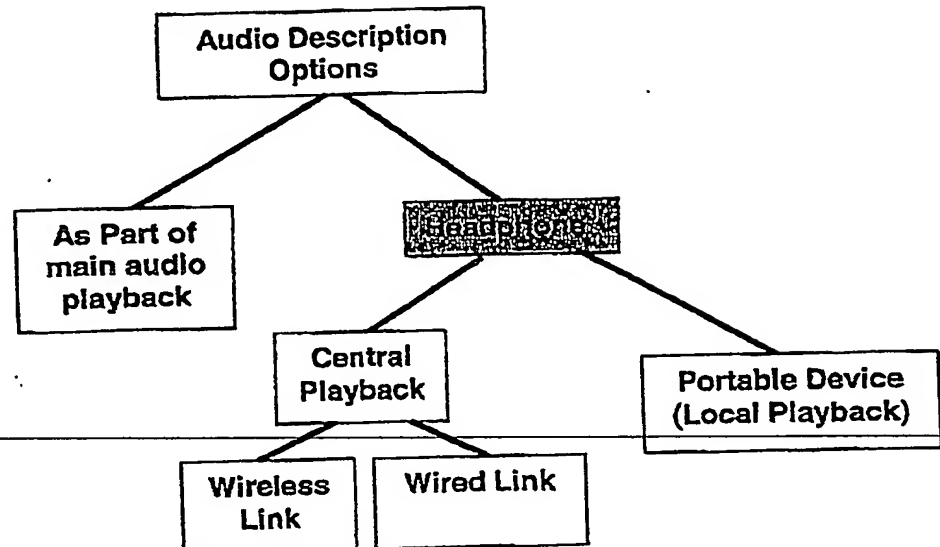


Figure 2 – Shows the main options for audio description

| Option | Comments |
|---------------------|---|
| Main audio playback | Will be heard by all |
| Headphone | Allows discrete playback |
| - Central Playback | DVS Theatrical®. Playback from DTS decoder with broadcast via FM radio or Infra-red connection. |
| - Local Playback | Intrasonics™ Movimate. Audio stored locally on mobile phone. |

4.3 Evaluation Criteria

So far we have outlined 10 different options. It is important to have evaluation criteria to see how these options can be combined to achieve the goal of full access at a reasonable cost.

Below is a suggested list of criteria.

| Criteria | Description |
|------------------------------------|--|
| Accessibility | This refers to the degree to which a system helps towards the goal of "any film, any time" |
| Usability | This deals primarily the two main areas of set-up and viewing for the end user. |
| Obtrusiveness | How does the system interfere with the general audience for example caption overlay on the film image and audio 'spill' from descriptions. |
| Infrastructure Requirements | What additional infrastructure is required and is the infrastructure required on a per screen basis. Also whether a solution is reliant on another proprietary system e.g. an audio system |
| Reliability | A system needs to be easy to maintain and must not break easily. |
| Flexibility | This includes the support for multiple languages, caption text and description variation, educational content and the ease with which new content can be added. |
| Safety | Any system must meet Health & Safety requirements. |
| Cost | Total lifetime costs and how the costs are distributed between the various parties involved. |
| Longevity | Expected lifetime of the system and protection against obsolescence. |

4.4 Comparison of the Main Caption Options

| Option | DTS-CSS | Real Window | InfraSound MAXIM |
|------------------------------------|--|---|---|
| Accessibility | Limited to screens with required equipment | Limited to screens with required equipment | Excellent – potential for any screen, any time |
| Usability | Excellent | Good | Good but requires management of mobile phone by user and results in split viewing that can be overcome with simple lens arrangement |
| Obtrusiveness | Poor - visible by general audience and obscures part of the screen | Very Good | Very good. Phone part can be turned off during the performance or set to a silent mode |
| Infrastructure Requirements | Requires DTS sound system and 2 nd projector | DTS sound system, data wall, reflector panels | None in cinema – although provision of phones would be preferable initially |
| Reliability | High ³ | High ³ | Good – phones will be managed by end-user |
| Flexibility | Single option per screening e.g. language | Similar to DTS-CSS | Very flexible. Multiple languages and content variation is possible for a single screening. Interactivity is also possible. |
| Safety | Excellent | Very Good | Very Good – people already take their phones into cinemas. |
| Cost | TBD | TBD | Comparatively low cost due to low Infrastructure requirement |
| Longevity | Will be superceded by digital projectors | Could be adapted for e-cinema | Phones are upgraded by the end-users. Audio-based triggers will work on any audio system. |

4.5 Comparison of the Main Audio Description Options

| Criteria | DTS Theatre | Interactive Mobile |
|-----------------------------|---|---|
| Accessibility | Limited to screens with required equipment | Excellent – potential for any screen, any time |
| Usability | Very Good | Good but requires management of mobile phone by user. Handsfree kits are ideal for listening |
| Obtrusiveness | Very Good | Very good. Phone part can be turned off during the performance or set to a silent mode |
| Infrastructure Requirements | DTS sound system, data wall, reflector panels | None in cinema – although provision of phones would be preferable initially. Requires embedding of triggers in film audio |
| Reliability | High ^a | Good – phones will be managed by end-user |
| Flexibility | Multiple audio streams are possible if supported by DTS systems | Very flexible. Multiple languages and content variation is possible for a single screening. Interactivity is also possible. |
| Safety | Very Good | Very Good – people already take their phones into cinemas. |
| Cost | TBD | Comparatively low cost due to low infrastructure requirement |
| Longevity | Could be adapted for e-cinema | Phones are upgraded by the end-users. Audio-based triggers will work on any audio system. |

5 CONCLUSION & RECOMMENDATIONS

We believe that the goal of universal access is attainable through the use of a various technologies available. Movimate complements other systems well because it is an off-screen solution and is not constrained by the need for in-cinema infrastructure. The opens up the opportunity for sensory impaired people to attend any film at any time. Movimate also gives the possibility of providing a wealth of other useful information to enhance the cinema going experience for all.

We therefore recommend the phased approach outlined in the document should be considered for funding by the Film Council as part of its initiative in this area.

| Term | Description |
|---------------------|---|
| Caption | Textual representation of speech and other sound effects |
| Sub-title | Textual representation of speech only |
| Open Caption | Captions that form a permanent part of the image and therefore cannot be turned off. |
| Closed Caption | Captions that can be turned-off |
| Soft subtitling | DTS description of their projector based system |
| On-screen captions | Captions displayed on the cinema screen, which includes both open and closed captions |
| Off-screen captions | Captions viewed on secondary display screen (by inference these are closed captions) |
| Audio description | An additional soundtrack that typically describes the visual elements of a film |
| Intrasonics | A technology that allows data to be hidden in regular audio which forms the basis for Movimate's synchronisation. |

APPENDIX A ABOUT THE GENERICS GROUP

The Generics Group is a leading integrated technology consulting, development and investment organisation, with an international reputation for successfully commercialising emerging science and technology. We operate from facilities, which include state-of-the-art laboratories, in Cambridge, England; in Zürich, Switzerland; in Stockholm, Sweden; and in Boston and Baltimore in the United States.

We operate in an environment where multi-discipline teams are positively encouraged to maximise cross-fertilisation of ideas and offer customised solutions to clients in a broad range of areas including:

-
- communications
 - business innovation
 - engineering
 - electronics
 - fuel cell and batteries
 - life sciences
 - location, sensors and tags
 - materials
 - medical products

We offer a full 'turn-key' product development for our clients following a structured approach to delivering innovative new products and solutions. Wireless technology, which ranges from acoustic through to free space optics, is at the core of Generics technology exploitation.

The greater part of Generics' work is for major international corporations with whom we have established close long-term relationships. We also work with small start-up companies, including many successful spin-outs from our own organisation and intellectual property development.

We are grateful to the following clients and partners for permission to include their names in the list below. The list is a sample only as much of the work we do is often confidential.

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Amey Datel (UK)
Aqualisa (UK)
Asea Brown Boveri (Switzerland)
AstraZeneca (UK)
A.T. Kearney (Italy)

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Nationwide Building Society (UK)
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